

⑪ ① No. 977910

④⑤ ISSUED Nov. 18, 1975

⑤② CLASS 15-64
C.R. CL.

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CANADIAN PATENT

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VACUUM CLEANER

*bled filter for
exhaust
air*

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APPLICATION No. 161,368

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FILED

Jan. 16, 1973

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PRIORITY DATE

Jan. 28, 1972 (4023) G.B.

No. OF CLAIMS

7

ABSTRACT OF THE DISCLOSURE

A vacuum cleaner includes a cleaning head, fan means, a filter bag, communicating ducting between the head and the filter bag, an outlet for exhaust air downstream of the bag, exhaust air ducting means connecting the exhaust air outlet to an outlet within the cleaning head such that the air recycled by the exhaust air ducting means impinges on at least one localized area within the area being cleaned by the cleaning head, the exhaust air ducting means being a tube extending in association with that ducting placing the head and the filter bag in communication, and an air manifold within the cleaning head and in communication with the exhaust air ducting, the manifold including transverse air outlet means wider at the ends than in the middle. The transverse air outlet means may be a transverse air outlet slot wider at the ends than in the middle, or a transversely extending line of orifices, the orifices at the ends of the line being larger than those in the middle.

This invention relates to a vacuum cleaner.

Conventional vacuum cleaners draw air either through a fabric (such as an upholstery fabric), or under the rim of a cleaning head through the pile of a carpet, or across a floor, and pass this dust-laden air through a filter-bag to exhaust. Disadvantages are that a relatively high power consumption is necessary to draw the air through the fabric (or under the head) and that the exhaust air is to some extent still carrying fine particles of dust and in any case causes streams of air which dislodges dust from its uniformly lying position and throws it into the air. It is commonplace therefore to dust the furniture after a room has been vacuum cleaned.

The present invention consists in a vacuum cleaner wherein ducting is provided to recycle exhaust air from an exhaust to a cleaning head, the outlet of said ducting lying within the head and being such that the recycled air impinges on one or more localised areas within the area being cleaned by the head.

The ducting may be a tube extending from the exhaust and positioned beside or (preferably) within an otherwise conventional flexible air tube and/or wand.

The cleaning head may be provided with a manifold having a plurality of air orifices through which recycled air escapes to impinge upon the localised areas within the area being cleaned.

Preferably there is provided a line of orifices transverse to the direction of head movement (as defined, for example, by wheels and optional transverse brushes). In



such a case the orifices at the ends of the transverse line are preferably larger than those in the middle. It is also possible to provide a manifold with a single transverse slot, possibly wider at the ends and possibly adjustable. Alternatively, where, instead of a relatively large cleaning head, a small brush-head is used for restricted areas, one restricted central orifice for recycle air can be provided. Alternatively again, for a furniture-cleaning head of small dimensions the recycle air can be provided at one side of the head and the air being drawn into the bag can be passed up the other side of the head.

Another form of hood may be fabricated in deformable rubber, preferably with an upturned rim, and used in conjunction with an internal tube bent into a circle or like shape and orificed on the underside and connected to the recycle air. As described more fully below, this provides considerable advantages both in manufacture and use.

It is possible to provide means to bleed off some of the recycle air obtained from the exhaust. One such means may be a selectively openable and closeable orifice, possibly positioned on a wand extending to the cleaning head. Another such means may be a bleed filter allowing only a little air to be subjected to further filtering and then escape. By this expedient while most of the air under the cleaning head is effectively being recycled, a small proportion of make-up air can be drawn in which is convenient when operating in corners or when using the cleaner to clean upholstery by drawing a small amount of

air through the fabric.

The invention will be further described with reference to the accompanying drawing in which:-

5 Figure 1 is a general view of a vacuum cleaner according to the invention;

Figure 2a is a view from below of the cleaning head of such a vacuum cleaner while Figure 2b shows a detail of a variant of this head;

10 Figure 3 is a diagrammatic representation of a feature of the cleaning action of such a head;

Figure 4 shows diagrammatically a different form of cleaning head;

Figure 5 shows a cross-section through such a head.

15 Figure 1 shows a vacuum cleaner consisting of a body 1, a flexible tube 2, and a hand-piece or wand 3. The wand is terminated by a cleaning head 4. The vacuum cleaner body 1 has an inlet end 5 and an air exhaust end 6. Tubing 7 is connected to this exhaust end 6 and passes
20 into the wall of flexible tubing 2, through a duct 8 within the flexible tubing which duct 8 is however spaced from the internal wall so as to leave passage for duct-laden air coming from the head, and down through a similar duct 9 within the wand 3 which is again spaced from the wall to provide an air passage.

25 Cleaning head 4 is shown in more detail from below in Figure 2a. In the embodiment shown it consists of an outer hood 10 and transverse rotary brush 11 mounted upon shaft 12 supported in wheels 13. The equivalent structure to the brush, shaft and wheels 11, 12 and 13 is shown

diagrammatically on the other side of the hood at 14.
 There is an air outlet orifice 15 which is connected
 by the wand 3 and the tubing 2 to the air inlet 5 on
 the body, and an air manifold 16 connected by air inlet
 17 to the internal ducting 9 and 8 and, via tubing 7,
 to the air outlet 6 of the cleaner body 1.

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^{2b}
 In Figure ~~2a~~ the manifold 16 is variously orificed
 at 18 as shown.

In Figure 2b the manifold 16 is provided with a
 slot 18a and an adjustable plate 18b, so that a single
 elongated orifice is defined whose exact shape depends on
 the adjustment of the plate by screws 18c.

In use, as the cleaning head 4 is passed to and fro
 over a floor, the conventional brushing action exerted
 by brush 11 is supplemented by the localised impact of
 air through the orifice holes 18, or slot 18a, in the air
 manifold. It will be observed that in the embodiment shown
 in Figure 2a the orifice holes 18 are variously sized so
 that the effected impact of air upon the underlying floor
 is generally equalised at each separate air jet; while
 a similar effect is obtained by the shape of the elongate
 orifice in Figure 2b.

While it is not desired to limit this invention to any
 theory of operation, it is believed that for example the
 plurality of air jets coming from the orifices 18 impinge
 upon an underlying surface (such as that of a carpet)
 as shown in Figure 3 and that the various fibres of the
 surface are blown apart and generally subjected to a
 localised turbulent air flow so that any dirt and dust

entrapped within them becomes loosened and can be drawn away through the air outlet 15. It will be observed from Figure 3 that (in the embodiment of Figure 2a) not only is there a region of turbulent air flow 19 in each instance but that, by providing separate jets of air from each orifice in the manifold, there are defined zones of apparently even greater turbulence at 20 where the action of the equipment is believed to be further enhanced.

The invention can be embodied in a number of different ways while still providing the essential feature of localised impact of at least one jet of air recycled from the exhaust end of the cleaner. Thus, the type of cleaning head shown at 4 can be replaced by other more specialised heads with suitable ducting and the connection between the wand 3 and the cleaning head or between the wand 3 and the flexible tubing 2 and an alternative form of head is shown in Figures 4 and 5, which for convenience will be described together.

In this embodiment a flexible, generally pyramidal rubber hood 21 with rounded edges 22, and axially about 8 inches (20 cms) across, is provided internally with a tubular ring 23 orificed on its underside at 24. This ring may be closed at one end, or rejoin its air supply line 23a. The hood is deformable to fit easily into awkward corners or over uneven surfaces. As before, air flow is in the direction of the arrows 25 (in) and 26 (out). The jets of air reach right down into a carpet pile 27 and blast the dirt upward to where it is drawn away. However no power consumption is needed to draw air in through the compressed pile at 28, as is needed

with a conventional cleaner, and the cleaning action is spread over all of the surface inside the hood instead of concentrated around the edges. Also, the brushes can be dispensed with, so that the hood is capable of considerable deformation, and the equipment is cheaper to make and easier to maintain.

While the equipment is shown with a flexible tube 7 extending along the cleaner, such a tube can of course be incorporated within the casing so that the equipment has a generally conventional appearance. It is of course also possible to embody the invention in an upright vacuum cleaner by suitable ducting between the exhaust end and cleaning head.

A further feature which can be incorporated with the equipment shown is the provision of additional air inlet or exhaust means for a proportion of the air which is used. As will be apparent from the drawing, it is possible to operate the equipment with 100% recirculated supply of air. In many respects this is preferable since no supply of air then escapes into the room and carries with it fine particles of dust or at least displaces dust from hitherto uncleaned surfaces. However, it is possible to incorporate additional air in the air-intake side (for instance with a manual control on the wand 3) or to lose some of the air in the exhaust side. This can be achieved by, for example, a bleed filter which allows effectively no dust to escape but allows a small portion of the air to seep out. An advantage of this would be that there is always a slight negative pressure

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in the hood which needs to be counteracted by a small
ingress of air around the edges. This is valuable if,
for example, the cleaner extends over the edge of a
carpet and a small gap is left which might otherwise
5 be a source of escaping dust-laden air if 100% recircula-
tion is used. If, for example, 5% of the exhaust air is
bled away to atmosphere through a very fine filter, it
will need to be made up by a corresponding small intake
of air under the head 4 and this should be adequate to
10 cope with any loss of dust-laden air when cleaning
over the edges of carpets or in awkward corners, or to
provide a small flow of air through a free-standing
upholstery fabric. Of course, the provision of this
small amount of air does not need the power consumption
15 which would be required to suck in all of the air under
the edges of the head 4, which is a major source of the
power consumption needed in a conventional vacuum cleaner.

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THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A vacuum cleaner comprising a cleaning head, fan means, a filter bag, communicating ducting between the head and the filter bag, and an outlet for exhaust air downstream of the bag; further comprising the improvements of exhaust air ducting means connecting said exhaust air outlet to an outlet within said cleaning head such that the air recycled by said exhaust air ducting means impinges on at least one localized area within the area being cleaned by said cleaning head, said exhaust air ducting means being a tube extending in association with that ducting placing the head and the filter bag in communication, and an air manifold within said cleaning head and in communication with said exhaust air ducting, said manifold including transverse air outlet means wider at the ends than in the middle.

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2. A vacuum cleaner as claimed in claim 1, wherein ^{said} ~~an~~ outlet means comprises a plurality of air outlet orifices arranged in a transversely extending line and the orifices at the ends of said line are larger than those in the middle.

3. A vacuum cleaner as claimed in claim 1, wherein said air outlet means comprises a transverse air outlet slot wider at the ends than in the middle.

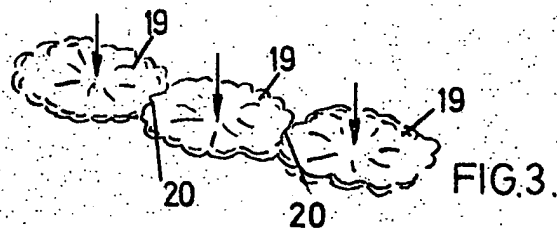
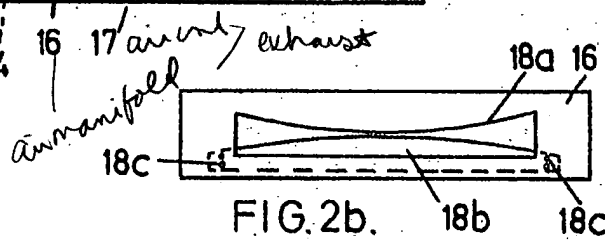
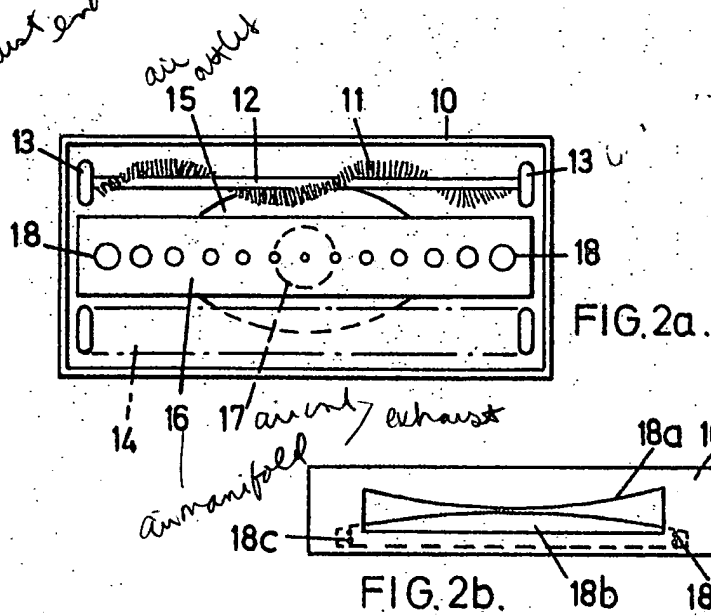
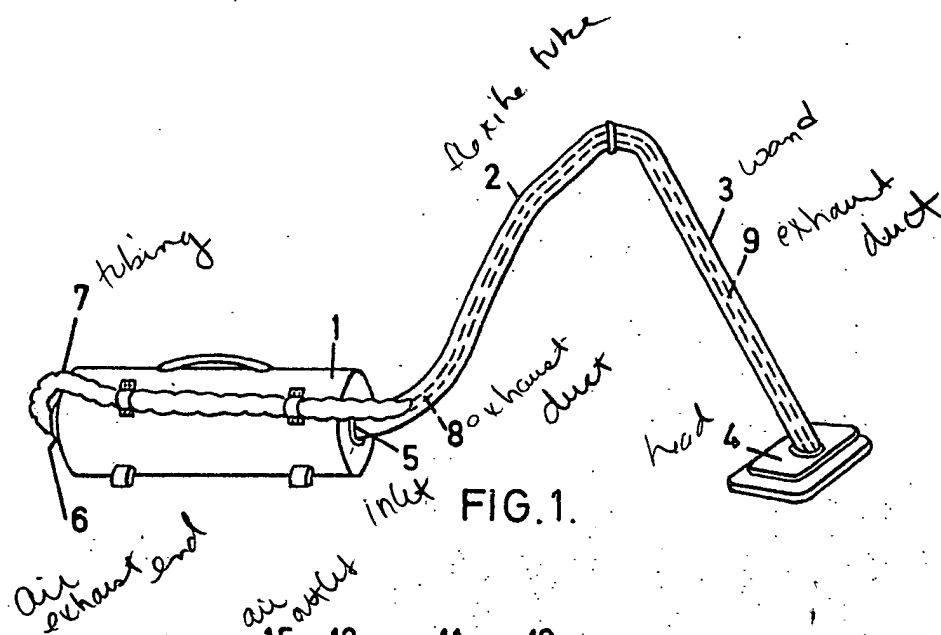
4. A vacuum cleaner as claimed in claim 3, wherein said slot is adjustable in width.

5. A vacuum cleaner as claimed in claim 1, further comprising bleed air outlet means in said exhaust air ducting.

6. A vacuum cleaner as claimed in claim 5, wherein a filter layer is provided to cover said bleed air outlet means.

7. A vacuum cleaner as claimed in claim 1, comprising one or more transverse brushes within said cleaning head.





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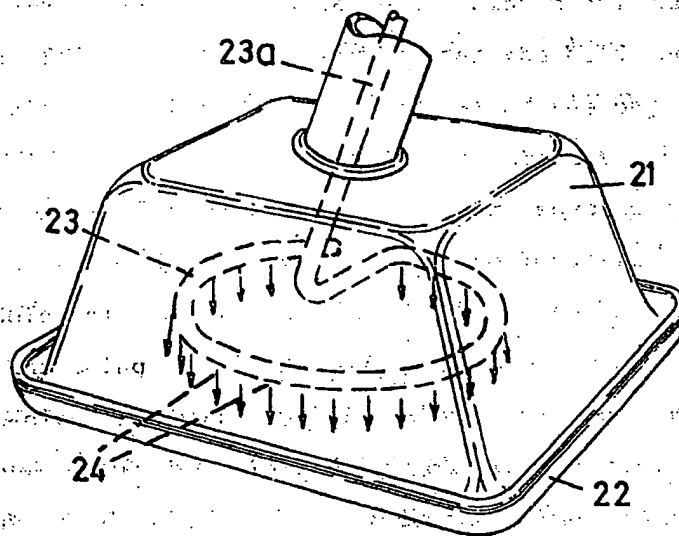


FIG. 4.

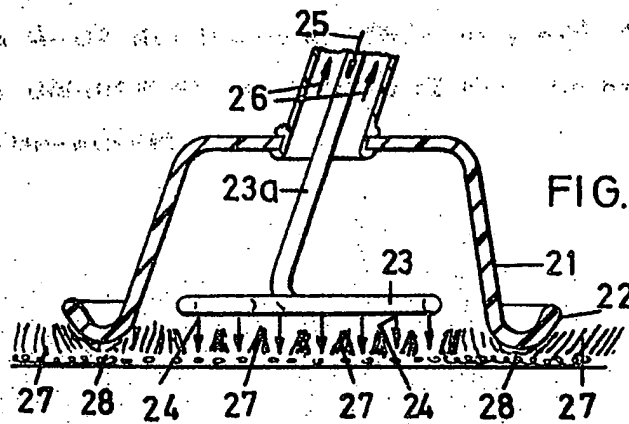


FIG. 5.

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